est proportion of AEFI (9.3%). Univariate analysis detected that drug allergies (OR = 3.1, CI [1.0-8.1]) and receiving tetanus vaccine in the prior three months (OR = 4.5, CI [2.8-7.5]) were associated with AEFI. Vaccine demand exceeded supply and 98% of vaccinees stated that they would like to receive annual influenza vaccination.

Conclusion: This study detected many more AEFI than the national passive AEFI surveillance system showing a need for improvements. Awareness about AEFI should be raised by health care workers so that vaccinees are sensitized to seek immediate medical care. Follow up surveys should be included with future vaccination campaigns until the passive surveillance is improved. The acceptability and demand for influenza vaccine make a case for future targeted influenza vaccination campaigns in Laos.

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Invasive pneumococcal disease: impact of pneumococcal vaccination in South Australian children

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Background: *Streptococcus pneumoniae* (pneumococcus) causes invasive pneumococcal disease (IPD) worldwide resulting in more deaths than any other vaccine preventable disease. The rates of IPD in indigenous children in Australia have been the highest in the world, even when compared with other indigenous groups. Children <2 years of age are at increased risk of severe disease and potentially serious sequelae. In 2005, a 7-valent pneumococcal conjugate vaccine (7vPCV) was introduced within the Australian National Immunisation Program.

Methods: This cross-sectional study compared the causative pneumococcal serotypes and IPD-associated complications before and after introduction of 7vPCV in children admitted to the Women's & Children's Hospital, South Australia. Pneumococcal serotypes were identified from culture confirmed cases. Admission details and complications were captured using a data collection questionnaire. Disease severity was measured using a modified Paediatric Logistic Organ Dysfunction (PELOD) score. Data was analysed using the Pearson chi-squared test.

Results: Between 2000-2010, 145 cases of IPD were identified, of which 116 were serotyped. 7vPCV serotypes caused 87% (59/68) of serotyped cases prior to introduction of the vaccine compared to 21% (10/48) following introduction of 7vPCV ($p < 0.001$). However non-7vPCV serotype cases have increased. Serotype 19A has emerged as a major cause of IPD (3/68 cases before versus 20/48 cases after 7vPCV was widely available).

IPD cases due to non-7vPCV serotypes were more likely to report complications ($p < 0.025$). There were 3 cases of IPD reported to be complicated by empyema before 7vPCV was widely available compared to 10 cases after the vaccine was introduced. IPD-related empyema was also associated with admission to the high dependency/intensive care unit ($p < 0.001$). Pericarditis ($n = 1$) and Non-7vPCV serotypes may be associated with more severe disease ($p = 0.05$).

Conclusion: The reduction in IPD caused by PCV7 serotypes is partly offset by an increase in non-7vPCV serotype disease. Non-7vPCV serotype disease is associated with more reported complications. Predominant circulating serotypes may impact disease severity.

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Development of conjugate vaccines for enteric fever

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Background: The implementation of conjugate vaccines has made a significant impact on the burden of bacterial disease in both developing and developed countries. Enteric fever causes >25 million cases of disease yearly worldwide, with more than 90% of the disease burden reported in Asia. In this region, protein-polysaccharide conjugate vaccines have potential to reduce disease caused by *Salmonella enterica* serovars Typhi and Paratyphi A, in all age groups but particularly the very young. The Novartis Vaccines Institute for Global Health (NVGH) has developed Vi-CRM197, a conjugate vaccine against *S.* Typhi. Based on recent surveillance data from south Asia, up to 50% of enteric fever cases are caused by *S.* Paratyphi A, and thus NVGH is also working to augment Vi-CRM197 by the addition of a component specific to *S.* Paratyphi A, the O-specific polysaccharide (O:2), conjugated to CRM197.

Methods: Vi-CRM197 was evaluated in European clinical trials, and is currently being evaluated in endemic populations. A novel method for O-antigen extraction directly from bacteria culture and for its purification and conjugation has been developed. The O:2-CRM197 conjugate alone or formulated with Vi-CRM197 has been tested for immunogenicity in mice.

Results: Vi-CRM197 was highly immunogenic in humans, inducing higher Vi specific antibody levels compared to Vi polysaccharide control. The process development of O:2-CRM197 has resulted in a reproducible and scalable method for manufacture. O:2 conjugate alone or in combination with Vi-CRM197 induced high levels of serum anti-O:2 IgG following immunization of mice. These anti-O:2 containing sera possess potent bactericidal activity against *S.* Paratyphi A in vitro. No immunologic interference was observed in the levels of anti-Vi, anti-O:2 or serum bactericidal activity in animals immunized with the bivalent combination.

Conclusion: Work is ongoing to further characterize the immune responses generated by the bivalent vaccine (Vi-CRM197 + O:2-CRM197) to further support its development. The current data demonstrates important attributes of NVHG's bivalent vaccine aimed to reduce disease caused by *S.* Typhi and *S.* Paratyphi A.

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